Cinnabar:
The Symbolic, Seductive, Sublethal Shade of Pompeii

Master’s Thesis

Presented to

The Faculty of the Graduate School of Arts and Sciences
Brandeis University
Department of Classical Studies
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In Partial Fulfillment
of the Requirements for the Degree

Master of Arts
in
Ancient Greek and Roman Studies

by
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May 2015
Acknowledgements

I thank Ann Olga Koloski-Ostrow and Andrew J. Koh, for their generous time and guidance with this thesis, the Master’s of Ancient Greek and Roman Studies program, and future professional endeavors. With sincere gratitude to the Rev. Walter Cuenin, whose 2012 tour of Rome began this journey. To Ann O. Koloski-Ostrow and Steven Ostrow, a special thank you, for sharing the ancient world and sites throughout the Bay of Naples, and the treasures of Pompeii and Herculaneum.

This paper is dedicated to Frederick M. Lawrence, President of Brandeis University, for his unwavering support in expanding horizons and completion of this thesis and degree.
Abstract

The city of Pompeii lies within the southern Italian region of Campania, nestled between the Bay of Naples and the massive Mount Vesuvius. The archaeological remains and continued excavation of the city offer scholars a rich opportunity to delve into the thresholds of ancient homes (domus), and the rituals of daily life. Through analysis conducted using primary and secondary resources, in combination with an artist’s experience, this paper serves to explore one element of the stunning visual force within the ancient decorative arts arena - cinnabar - the symbolic, seductive, sublethal shade of Pompeii.

The research for this paper incorporates the history of cinnabar, from environmental extraction and processing of the ore; to the health ramifications of the mercury-based mineral; and focuses on the refined creative craftsmanship of the artisans. The overall role of red, aligned with the distinctive painting styles and mythological subtexts are explored, using The Villa of the Mysteries and The House of Marcus Lucretius Fronto V.4.II, as primary interpreted subjects.

Woven into the discussion are the post-Pompeiiian modern works of abstract expressionist, Mark Rothko (1903-1970), and the inspiration the ancient world cast over his artistic evolution. His use of red, and production of the famous Seagrams triclinium panels, is presented in direct correlation with his visit to Italy, and the Villa of the Mysteries, in 1959.

Finally, the chemical changes and challenges inherent in the application of cinnabar is examined, including the question initiated from data presented in a 2011 Italian study conducted in Herculaneum, with possible consequence in Pompeii: is yellow the new red?
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Introduction

Pompeii, a city of legend, suffocated by volcanic pumice in 79, CE under the reign of the Emperor Titus, arose from the ashes in 1748 upon accidental discovery. Following a period of theft and looting, the Bourbon monarchy took control over the serendipitous find, plundering the site to feed their aristocratic hunger for the ancient art extracted to the surface. Artifacts soon filled the private gardens and homes of the wealthy and, as private collections grew, the seeds and roots of modern day archaeology were sown through the early efforts of visionaries such as Karl Weber (1764) who was instrumental in systemizing artifacts retrieval of the Villa of the Papyri in Herculaneum, and Giuseppe Fiorelli (1863), whose oversight of Pompeii lead to systematic excavation techniques and documentation, entrance fees to allow more open access to the public, and the plaster casting of human and animal remains.

While not a famous city for its time, during the Roman occupation of the 1st c. BCE, and 1st c. CE, Pompeii’s regional popularity grew among the wealthy looking to escape the
heat, political demands and distress of Rome, leading to an influx of vacation villas along the Bay. Remnants of the ancient paintings within their excavated shells, breathe life into the architectural and artistic themes left behind. Two specific examples - The Villa of the Mysteries and The House of Marcus Lucretius Fronto V.4.II - serve as the main ‘storytellers’ using the visual mythological imagery in their surviving wall paintings to assess the application, intent and strategic use of color during that specific timeframe.

The research for this paper incorporates the history of cinnabar, from environmental extraction, processing and pernicious subtext, to the refined creative uses of the mineral and craftsmanship of the artisans. The lush seductive nature of this powerful color proved as expensive to an aristocrat’s purse, as the substance did to those who produced it, for cinnabar is Hg2 = mercury, a toxin of highly sublethal properties for those exposed to it, adding a health issue layer to the mix.

Chemical changes of cinnabar occurred in the cities of Pompeii, famous for its vermillion-covered walls, and at Herculaneum, with the cited causes including the sun’s soaked-filled rays and the violent volcanic assault on August 24-25, 79 CE. Advanced technology has provided scholars with the ability to examine wall painting pigments in CSI-type fashion, resulting in a controversial color contest between yellow and red. The results of a 2011 Italian study, based in Herculaneum, challenges long-held scholarly theories of pigment application, with chemical alterations at the forefront, raising questions of true color origination. This new information has led to speculation as to Pompeii’s status as a true ‘city of red’.

Chemical pigmentation studies have allowed scholars to conclude that the incinerating heat generated from the Vesuvian pyroclastic blasts caused yellow-based pigments to
turn red, in some instances. The new data presented in the 2011 study supports their theory that some walls, long-held to have been red were, at their core, yellow. The impact this revelation has, both overall and directly, on Pompeii is uncertain, as the Herculaneum study only included ocher-based reds, not cinnabar, and Pompeii’s walls have yet to be extensively tested in the same manner. The data does provide one stunning example of the vital questions posed as the science and technology of archaeology unfolds amid on-going excavations of these historical ancient sites.

The efforts of archaeologists over the centuries, have slowly pieced together a tattered fabric of the time, giving perspective as to the daily lives of the city’s inhabitants. From the excavated structures, temples and tombs; to the wall paintings, sculptures and mosaics; and the brothels, toilets and human remains, scholars continue to work on the Pompeian puzzle. Primary sources from ancient writers such as: Pliny the Elder, Pliny the Younger, Vitruvius, Theophrastus and Diodorus, lend vitally important voices and context to the on-going telling of the city’s tale, for they serve as the accountings of ancient rites, rituals and life. For cinnabar, the descriptions gleaned from their writings offer a rare glimpse from when it was discovered, through mining, uses and results.

Missing from these texts, are the silent voices of those directly involved and impacted - the miners, artists and patrons - to give us an understanding of what was faced on a daily basis. A contemporary source comes from the summer of 1861, when California State Geologist, William Henry Brewer, on a mission to document the existing mines within the state, documented his travels in personal journal entries. “Cinnabar: (Substrate 16),” describes his visit to the New Idria quicksilver mine on July 24, 1861, offering one man’s experience down in the depths of the earth.
Cinnabar
(Substrate 16)

The matrix rock is metamorphosed slate, porous, fractured,
the ore distributed capriciously,
Tunnels diverge in all directions threading unmined seams,
the veins of cinnabar diffused in streaks across drift faces
brilliant blood red under our candlelight,

the miners naked above the waist, their shoulders burnished copper,
a hard sort - Cornishmen, Chileans. The mines
are profitable to stockholders, Nine hundred flasks per month
are shipped in pairs by mule for San Francisco. In brick furnaces
the ore, reduced and roasted, distills quicksilver.

The atmosphere it vents of arsenics, sulferous acids,
and vapors of mercury is ruinous.
The men who go inside to clean the condensation chambers
do not recover, yet the higher wage commands fresh victims yearly,
and all are poisoned by the furnace work.

We re-emerge into the scorching daylight world at noon
and took our observations for altitude.
Lunch hour blasting shook our instruments sporadically
like thunder underground, far off, the sand hot through our boots.
North and south from the summit chain after chain

of mountains without one tree, a scene of unmixed desolation,
steep bluffs cut in stratified gravels, hardened,
tilted and stood on edge in recent epoch by earthquake,
estward across the San Joaquin above the veil of dust
the sawtooth crest of the Sierra glitters.

William Brewer,10 C.S.G.S.11

- Jim Powell

This poetic accounting of a cinnabar mine, proves an excellent lead into the next
chapter describing the extreme environment faced by the ancient miners tasked with the
extraction of the raw ore, and fluid quicksilver. The expensive endeavor proved costly on
environmental, financial and human levels.
Chapter I

Environment and Extraction

Within the color spectrum, hue combinations are derived from three lone pigments, which cannot be created by mixing other colors together. Known as the primaries: red, yellow and blue symbolize the cornerstones, extracted directly from natural sources, of which other subsequent shades occur. The colors of excavated Pompeii have faded over time, but the visual impact and importance of red still exist within and on the city's walls. Enlivening, expensive, endangering qualities of cinnabar and its seductive shade were, and are, a significant presence.

As with Pompeii and Herculaneum, cinnabar was found when someone digging for one thing came upon another. According to Pliny the Elder, Theophrastus was to have said “minium” was first discovered by Callias the Athenian in 439 BCE, who was “in hopes to extract gold, by submitting to the action of fire the red sand that was found in the
silver-mines.” Contrary to Pliny’s accounting, is the argument that no evidence exists to support this claim, rather that “Callias, experienced in ore dressing, went to Ephesus to devise a similar system for use with cinnabar ores.”

As one of the ancient world’s highly prized metals, the extraction of silver ore led to the dangerous and deadly practice of deep-vein mining, through which cinnabar and a secondary silver strain known as “quicksilver” were harvested. The chemical symbol associated with the second element is Hg, "hydrargyrum" in Greek, meaning liquid silver, most commonly known as Mercury, a metal of vital importance, with one primary function being a refiner of gold and gilding of copper.

The science of chemistry was not yet on the horizon during Pompeii’s ancient life and, before its evolution, the art of alchemy was the process by which metals were refined. The attribution of a homonym gives clear indication of the importance quicksilver played in Roman culture. A major Roman god, known for his fleetness, along with the fastest known planet of its time within the solar system, were given the same name, under different contexts, reflecting directly back on the silver’s speed. Mercury, with his winged sandals, acted as the messenger of the gods and, before the periodic table was established, Mercury the planet, was the designated symbol used by alchemists in identification of the element.

Mines rich in cinnabar and silver veins were relatively rare, with Italy (Mount Amiata, 295 BCE) and Spain (Almadén, 201 BCE), becoming two of the major sources for the ore during Roman expansion of the empire. One reason for this is the specific environment in which cinnabar can be harvested. “It [cinnabar] occurs as impregnations and as vein fillings near recent volcanic rocks and hot springs and was evidently deposited near the surface from solutions which were probably alkaline.” Some veins proved rich, with Mount Ami-
ata remaining active until the 1970’s, and Almadén continuing on to produce one of the richest quantities of liquid mercury on a global scale.\textsuperscript{37}

Found to be relatively soft and easy to process and grind into a versatile powder,\textsuperscript{38} cinnabar appeared an expedition’s gold-mine of a natural red compound. The alluring quality of cinnabar was deceiving, for within the quartz-like red beauty lay a sneaky, sinister side. Identified by the chemical symbol HgS, cinnabar is none other than quicksilver’s first cousin, mercury sulfide, one of the most highly valued, and sublethal, elements known to the Roman world, making the extraction, processing (detailed in Chapter II), and use of both elements very hazardous affairs.

Mining for cinnabar in ancient Roman times was hazardous, and deep-vein mining proved the most challenging and perilous out of the three techniques designed by the Romans.\textsuperscript{39} Geology was not yet a science when the Romans went in search of ore sites, but they were fairly astute in the practice of locating sources.\textsuperscript{30} Once discovered, the mining process began with a horizontal chiseling-out of main entrances known as \textit{adits}, providing for three of the major construction challenges: access, ventilation and drainage. After being established, miners would drive vertically downward, crafting narrow stone or timber-lined shafts,\textsuperscript{31} using the ore veins to direct the direction and depth of the channel, which at times could reach 200 feet below. From these shafts, horizontal galleries would be hollowed-out, usually very small, tight and braced with wood, from which the ore would be excavated, as illustrated in Figure 6. Miners would navigate the slippery shafts by way of footholds carved into the sides as pseudo steps,
or ladder supports.\textsuperscript{32}

Given the complexity and inherent hazards involved, deep-vein mining was used most often in the pursuit of prized quarry such as gold and silver,\textsuperscript{33} or as in this case, cinnabar, \textit{Figure 7}, to justify the cost.\textsuperscript{34} The environment was dark, dank and dangerous, with the constant specter of a mine collapse ever-present.\textsuperscript{35} "...and not infrequently clefts are formed on a sudden, the earth sinks in, and the workmen are crushed beneath..."\textsuperscript{36}

\begin{figure}[h]
\centering
\includegraphics[width=0.4\textwidth]{figure7}
\caption{Cinnabar Ore}
\end{figure}

\begin{figure}[h]
\centering
\includegraphics[width=0.4\textwidth]{figure8}
\caption{Roman Miner's Hammer from Spain}
\end{figure}

\begin{figure}[h]
\centering
\includegraphics[width=0.4\textwidth]{figure9}
\caption{Greek Hammer, 4th or 3rd c. BCE}
\end{figure}

The primitive nature of the tools, as shown in \textit{Figures 8} and 9, pressed into service to carve out and excavate the mines, demonstrates the sheer physical force and stamina necessary, and is a true testament to the conditions and sacrifices made on the human front. Iron met earth, boulder and rock as miners armed with gads, hammers, picks, crowbars, battering rams and wedges,\textsuperscript{37} hacked and rammed away far below ground, moving and extracting the ore and minerals from deep within the crevices. Once free, the seeping quicksilver was col-
lected, and ore chunks racked up, gathered into baskets and hauled to the surface. The scene underground, of cramped spaces amid a multitude of miners operating in extremely poor conditions, is well illustrated on the Greek votive tablet in Figure 10.

![Figure 10 - Greek Miners 550 BCE on a Votive [Burial] Tablet](image1)

![Figure 11 - Roman Terracotta Lamps from Spain and Portugal End of 1st C. CE.](image2)

Torches and terra-cotta oil lamps, as depicted in Figure 11, supplied limited light and visibility, all the while choking the stale air with heat and noxious fumes. These lamps would also be used as ‘the canary in the coal mine’, lowered into the shafts to detect foul gases, indicating if additional shafts were needed on either side to increase ventilation and relieve pent-up fumes. Of further challenge was the temperature, for every 30 meters deep, the heat rose 1 degree Centigrade.

A major contributing factor to the horrendous air quality was the Roman practice of using fire to heat and loosen the rock and ore, leaving the galleries a hot, poorly ventilated mess of sheer misery, from which there was no relief. "In mining either by shaft or by gallery, barriers of silex are met with, which have to be driven asunder by the aid of fire and vinegar; or more frequently, as this method fills the galleries with suffocating vapours and smoke, to be broken to pieces with bruising-machines shod with pieces of iron weighing one
hundred and fifty pounds: which done, the fragments are carried out on the workmen's shoulders, night and day, each man passing them on to his neighbour in the dark, it being only those at the pit's mouth that ever see the light.”  Miners lived within the galleries, miles in, for months at a time without access to fresh air.

As if noxious air and dim lighting were not challenge enough, flooding from underground sources and water run-off from mining practices presented an ever-looming threat. Not to be dissuaded, the Romans devised ways of resolving the issue via enslaved-labor bucket bailing brigades and, by 1st c. CE, mechanical equipment. “Stoping had been carried out 80 feet below the audit level, which indicates that some form of drainage machine must have been used.” Two types had been designed and built in the 1st c. CE, the Archimedean (Egyptian) screw (cochlea), as illustrated in Figures 12 and 13, and the waterwheel, depicted in Figures 14 and 15.
The basic premise behind the Archimedean Screw was an internal cork-screw water-wheel, spiraled inside an oak or terra-cotta barrel. When cranked by handle, rotated by animals, or cleated tread by humans, the internal mechanism captured and pumped water upwards to the next level (sump), where the next screw was placed and ready to repeat the process, and so on, until the water was drawn out of the shaft. This proved far less laborious, and much more efficient, than hand-held buckets being passed through the network of tunnels, especially when mining below water level, with large volumes to move.

The waterwheel was a vastly improved Archimedean screw upgrade. Oak was the material of choice, from the ground up - including the bearings, with a main bronze axel from which to spin. The premise was similar to the screw, capturing and lifting water in treadmill fashion to the next sump level and positioned waterwheel, and so on, until completely pumped out from the source. Both methods were expensive to operate, but while additional manpower was needed to make the wheels turn, the amount of water able to be drained at a far faster pace made it worth the cost and effort to the mine operators.

To maximize the volume being extracted, wheels could be used in pairs operating in opposite directions. "At Sto Domingos the wheels were set along a gallery with a slope of 40 degrees. The volume of water raised, 82 to 86 liters (21-23 gallons) through 3.66 m. (12 feet) per minute..." Human toll not withstanding, both instruments are exemplary examples of Roman engineering.

The deep-vein mining process was the equivalent of death-camps for those exiled to work in them, the slaves, criminals and other society-deemed expendables. "...they say that the air in the mines is both deadly and hard to endure on account of the grievous odour of the ore so that the workmen are doomed to a quick death." Miners would work and live
underground, without access to the surface or clean air, for months at a time and for the mine operators, and Roman Empire, it proved a cost-effective, highly profitable and efficient system. “The warders were among the first to recognize that there was a high likelihood that the prisoners would become poisoned and spare the keepers the need for formal executions.”

As many artisans and workers of the ancient world were enslaved, their level of the risk, from excavation to processing to application, resulting in repeated exposure, contributed to illness and death. When sources speak of ‘Pompeian Red,’ in terms of its expense as a premium and desired color, the human toll must be a considered factor and contributor to the overall cost of cinnabar production, for the effects of mining resulted in environmental and human devastation. So much so that at some point during the 1st c. CE, “Roman authorities closed the Italian mines and imported mercury from Spain, perhaps to protect Italian workers from mercury poisoning or to prevent the devastation of the Italian landscape.”

Ancient texts speak of the purpose and process of cinnabar mining from the viewpoint of those on the outside looking in. In July of 1891, William Henry Brewer visited the desolate quicksilver mines of California, and his journal entries offer an insider’s view of the environmental construct of cinnabar mining, giving a small glimpse into life underground:

“The mine is almost on the summit of a mountain about five thousand feet high. The ore is diffused in streaks through the rocks and is wrought extensively. Diggings, galleries, shafts, and cuts run in every direction, wherever the richest ore may be found. The rock is a very remarkable one, a sort of altered slate, acted on by heat and hot water, and the brilliant red ore is diffused through it.

The view from the summit is extensive and peculiar...chain after chain of mountains, most barren and desolate. No words can describe one chain, at the foot of which we had passed on our way - grey and dry rocks or soil, furrowed by ancient streams into innumerable canyons, now perfectly dry, without a tree, scarcely a shrub or other befetation - none, absolutely, could be seen. It was a scene of unmixed desolation...”
"Monday we visited the largest mine, the New Idria Mine proper. We spent the day under ground. For six hours we threaded drifts, galleries, tunnels, climbed over rocks, crawled through holes, down shafts, up inclines, mile after mile, like moles, sometimes near the surface, at others a thousand feet from daylight.

The distribution of ore through the rock is very capricious, and where a thread of it can be found it is followed up, so the workings run in every conceivable direction, and being mostly mined by Chilean and Mexican miners, the work is more irregular by far than the burrows of animals. Sometimes we climbed down by a rope, hand over hand, bracing the feet against the wall of rock, sometimes on escaladors, sticks merely notched."^

Cinnabar extraction is a paradoxical process, a mineral beautiful to behold, while potentially deadly to those who beheld it. The extraction of the ore was just the first step in preparing it for different uses where its mercurial properties would be used as much for seductive splendor, as for insalubrious purposes, as is discussed in the following chapter.
Chapter II

Processing and Perniciousness

![Figure 16: Shades of Vermillion Pigment, Collection of The Harvard Art Museums](image)

One of the best accountings for the processing of cinnabar comes from the ancient texts of Vitruvius, in which he describes in detail how miners removed raw ore, (clods), containing *minium*, and quicksilver from the mines. According to his writings, the miners's tools extracted the clods, with quicksilver leaking out and being harvested within the galleries. The chunks were then oven-dried, causing the remaining quicksilver to separate from the red mineral. These remnants were minute enough that water, a natural repellent to mercury, was used as a wicking vehicle, in which the slivers of silver were drawn together like magnets into one lump mass. Once the silver had been extracted, the clods were
crushed, washed and roasted again, with the heat chemically bringing out the coveted vermilion color.58

The processing of metal, which began in the Near East (6,000 BCE), filtered down through Mesopotamia (3500 BCE), Egypt (2500 BCE) to Greece (400 BCE), is termed Metallurgy.59 In essence, the metal component is removed from the mineral composite, which in the case of cinnabar is the quicksilver from red ore, leaving two distinct products used for different purposes. The liquid silver for the processing of gold and copper,60 and the cinnabar for decorative arts, religious ceremonies and medicinal properties. "...a sand that shines brightly and resembles scarlet dye; ...collected and ground in stone vessels until it is as fine as possible then it is washed in copper ones...and what remains is taken and ground again and then washed. Skill is needed for this process..."61

Once the ore was brought out of the mines, the basic elements for pulverizing it into a powder were simple: water, an oven, fuel, a storage place to hold the product, and the manpower to make it all work. Heat is the primary element for metal processing, for it allows the mineral to release it, without changing the chemical make-up.62 "First they remove the earth and stones and such like things; after that there remain the precious substances which can only be removed by fire, namely copper, silver and adamant."63 Pinewood64 was popular for silver, but caused environmental issues in Greece due to the vast quantities harvested and used. Charcoal (carbon) was the other popular choice, as it burned hotter and longer than wood.65

Enslaved men and women took the dried red ore and, using mortars and mills, Figure 17, ground it into a fine, flour-like powder,66 Figure 18, washed the remains repeatedly, followed by a good roasting in the furnace, blanching out any lasting quicksilver and bringing
the vermillion to full bloom. Pliny reported that up to one ton of raw cinnabar was shipped to Rome each year from the Almadén mine for processing. Vitruvius’ accounting backs this up, stating that “the clods are brought from the mines there [Spain], and treated in Rome by public contractors.” Given that the shipments were “under seal,” indicates the importance cinnabar had to Rome’s economy, so much so that, “in the sale of it, the price is regulated by statute; it not being allowed to exceed seventy sesterces per pound.” With inflation, the value of one sesterces in 2014 would have been approximately $1.02 U.S.; making one pound of cinnabar up to the equivalent of $70.00 US. To put this in a more realistic context, in ancient times: a tunic cost 15; a donkey could be had for 500; and a soldier’s annual pay was 400. For the wealthy, “to be a senator it was a necessary condition to be worth at least one million sesterces.” Cinnabar was an expensive proposition.

Paint is essentially pigment and a binder mixed together. Turning ground cinnabar into a liquid vehicle for use in wall paintings, sculpture, and other forms of the decorative arts was a straight forward process, dependent on various binders, which allowed the paint to adhere to a variety of surfaces. Some of the popular binders of the ancient world were: lime, oils, egg tempera, gum arabic, wax, “goat’s blood or bruised sorb-apples.”

The ancients saw cinnabar as a highly prized product, but as we know today, the metal composite is mercury sulfide and highly toxic. An easy assumption might be that
the ancient Romans were not aware of the mineral's sublethal nature, for why seek out that which can cause devastating harm, up to and including death? A better question is what did they know, and when did they know it? Vitruvius laid claim that once cinnabar became silver-free, "its powers are feeble," but, according to Pliny, mercury was well known by the ancients to be poisonous, as was the effect cinnabar exposure had on those coming in close contact. "Persons employed in the manufactories in preparing minimum protect the face with masks of loose bladder-skin, in order to avoid inhaling the dust, which is highly pernicious." The relief illustrated in Figure 19 is an ancient visual depiction of miners, dressed in what may be their version of protective gear. With inhalation as one of the most common ways to be exposed to cinnabar's sublethal properties, this safeguard was a feeble attempt to stay the disease, with those sentenced to the mines expected to survive three years.

Evidence supports additional uses for cinnabar in writings and inscriptions, in books and on tombs and for triumphal celebrations. Ironically, one of the main non-decorative uses was destined for the medicine cabinet. For even with what was known of the mineral's sublethal properties, cinnabar and mercury were used in the ancient world for health remedies. Ramifications of mercury poisoning are severe, and can include neurological, emotional, visual, and major organ damage, which can lead to death.

The Chinese envisioned mercury "as the elixir of life," with the men ingesting cinnabar to become immortal, and drunk by women as a form of contraception. "Uses for cin-
nabar included smearing it on the feet to enable a person to walk on water, placing it over a
doorway to ward off thieves, and combining it with raspberry juice to enable elderly men to
beget children."87 Traditional Chinese medicines still manufactured and sold today contain
cinnabar, at times in high levels.88

Minium, as described by Pliny "...is a poison."89 While he felt it very dangerous to
contemplate using the mineral for medical treatment, he gave limited support for "those
cases in which it is applied to the head or abdomen, for the purpose of arresting haemor-
rhage, due care being taken that it is not allowed to penetrate to the viscera, or to touch any
sore."90 The reason behind Pliny's support lies in his assertion of cinnabar confusion - for
there were two. Cinnabar (minium) and cinnabaris (miltos), which was made from red earth,
(oobre),91 not mercury. Pliny maintains that minium and miltos were both commonly referred
to as cinnabar, leading some physicians to confuse the two and resulting in the dispensing of
poison to unsuspecting patients.92

Mercury was used as an early (1025 CE,)93 course for the treatment of syphilis, and
was the primary medicinal remedy from the 15th c. CE, into the early 20th c. CE. If the pa-
tient didn't die of the disease, the treatment could drive them mad.94

The pernicious nature of cinnabar made processing and handling a sublethal threat
to those exposed. The coveted color and richness of the vermillion hue, exemplifies the
wealth and status surrounding the decorative arts of the 1st c. BCE, through Pompeii's death
in 79 CE. The application and techniques used by the artisans demonstrate a high level of
skill and sophistication, discussed in Chapter III, as painting styles evolve and mythology
comes center stage. From the beginning of its use, to the end, cinnabar was a vital economic
and visual component for transforming Pompeii into the famous "city of red."
Chapter III

Artists and Applications

**Figure 20 - Ancient Cinnabar Wall Fragment from Bay of Naples**

Much of the wealth of information garnered about the daily lives of Pompeians comes from the stunning, albeit crumbling and fading, excavated archaeological and visual remains. Walking through the streets, the close-knit architectural planning of the city is striking. Villas, apartments, storefronts and brothels intimately intermixed alongside one another, with the main Forum and its temples, baths, basilica, fullery and marketplace the acting center of political and social life.

The Roman house (*domus*), served as the physical nucleus for family and integrated commercial enterprises, including slaves and animals. “Like the Pompeian street, many a Pompeian house would have been, in our terms, an assault on the visual senses.”95 On a visit to Pompeii during the summer of 2014, I entered a number of *domus*, and they generated just such an assault by the solid nature of their construction, with the tall, thick, often windowless, walls enveloping around in a protective embrace. The architecture was deliberate, the
structures designed not only to serve as homes and businesses, but also as self-imposed private fortresses, securing occupants safety and the protection of their wealth and worldly treasures. Within these enclosures, artisans visually transposed darkened rooms, public and private, into spectral-soaked spaces fit for daily living, guest receptions and client transactions. The Greeks left heavy imprints on Pompeii within the realm of visual arts: wall painting, sculpture and mosaics, and the Romans, lovers of such sumptuous things, often used Greek artisans to handle their decorative needs.

Among interior enhancements was the continuing evolution of wall paintings, often mythologically based, which gave artists the visual capacity to brighten, lighten and enlarge tight rooms with little to no light.96 Two excellent examples are the wall paintings below, Figure 21 and 22, from inside the Villa of Poppaea at Oplontis.97 These photographs clearly illustrate the distinction between a dark, forboding untreated space, with that of a cinnabar color-filled interior.

![Figure 21 - Interior of Villa of Poppaea](image1)

![Figure 22 - Interior of Villa of Poppaea](image2)

In the late 19th c., archaeologist and art historian, August Mau, designed a sophisticated classification system of four distinct styles and characteristics of wall painting (see Ap-
pendix A), which are still the gold standard used today. His schematic blueprint offers insights into the life in Pompeii before and after the earthquake of 62 CE. When the Romans took final occupation of the city in 80 BCE, Second Style wall painting was in vogue, and when the end came in 79 CE, the city had been transformed through the stunning evolutions of Third and Fourth Styles. Two surviving main domus, the Villa of the Mysteries, located just outside the city’s walls, and the House of Marcus Lucretius Fronto, V.4.11, serve as two of the finest excavated examples of these styles, and stand as reminders of the glory that was, and is, Pompeii.

The artists of this era were highly skilled and often times enslaved. Their role was to work with the patron of the house, bringing the owner’s vision to life. Due in part to the structure of the patron-client relationship of the day, and scarce surviving documentation, little is known of the actual artisans, leaving scholars to decipher elements of their existence through the visual remains.

Unlike modern artistic ventures, contracted work in ancient time was intended, in large part, to spotlight the patron and his standing within Pompeian society, not highlight the talents of the individual artist. Out of the numerous paintings in the city, only one signature to date, no longer visible, was found. Painters and artisans plied their trades in an elitist society, where lower-class and enslaved peoples were intrical in the cities visual creations, but essentially served as an invisible means to an end for the patron, regardless of their prominence in the field. “The painter of the early and mature Second-Style wall was a master artisan if not an artist in the modern sense of the term.”

One area in which the color red played a dominant role, complete with signatures of the painters, occurred during the Imperial Period when programmata recentiora evolved.
These predominantly red and black political advertisements were crafted by sign-painters on the inside and outside of buildings in professional calligraphic style. Some worked alone, usually at night, others banded together in teams, much like their professional wall painter counterparts, with specific roles based on experience. "To date, twenty-seven sign-writers have been identified." These advertisements create a wealth of information for scholars on the political processes of Pompeii, and grant a glimpse into the concerns of the constituents. They also beg the question as to the reason some sign-painters were able, or allowed, to add their signatures, when their decorative arts counterparts did, or could, not. Perhaps the answers lie in patron/client privilege, the level of literacy, or the unexcavated portions yet to be uncovered and investigated in Pompeii.

In filtering through the materials used to create the priceless Pompeian wall paintings, cinnabar stands out high above the rest with its vibrancy, striking the senses with intense depth and range, and the intended showcasing of the wealth, power and prestige behind the hue's selection. The color permeating the ancient city, from paintings and *programmata*, to senatorial robes and religious offerings. This luscious red compound comprised the visual make-up of Pompeii. "I am not surprised that this colour should have been held in such high esteem; for already, in the days of the Trojan War, *rubrica* was highly valued, as appears from the testimony of Homer, who particularly noticed the ships that were coloured with it, [as illustrated in *Figure 23*], whereas, in reference to other colours and paintings, he but rarely notices them." "Ulysses and the Sirens," 3rd c. CE, Lisbon

While little documented evidence from ancient times existing to act as references or guides, archaeological excavations have led scholars to conclude that orchestrated work-
shops were operating in Pompeii. This premise has been supported through the wall paintings themselves, the patterns, themes and techniques, along with discovered structures and evidence of the tools of the trade – pigments, tools and other paraphernalia. Much like modern day interior design firms, teams of accomplished craftsmen, with specific skills and roles\textsuperscript{105} can be envisioned.

As reported by Pliny, cinnabar was so highly a desired color that the price was state-regulated at seventy sesterces per pound,\textsuperscript{106} “ten times more expensive than high quality red ochre from Sinope.”\textsuperscript{107} The cost was so prohibited, that the patron was very often responsible for providing \textit{minium} at his own expense on a project. This worked well in the favor of the artist, for not only were they not responsible for absorbing the cost, it opened up an unexpected financial, albeit illegal, opportunity. “\textit{Minium}, too, in another way affords a very convenient opportunity to painters for pilfering, by washing their brushes, filled with the colouring matter, every now and then. The \textit{minium} of course falls to the bottom, and it is thus so much gained by the thief.”\textsuperscript{108}

As discussed in Chapter II, pigments were prepared into paint through the infusion of different binders. Surface application was done most often by fresco technique, with paint applied directly onto a prepared wall section of wet plaster. The plaster acts as a vehicle and binder for the paint, which is a thickened paste made of pigment and water. As the plaster sets, the color adheres to the surface. The process is very challenging for once dry, the plaster and image become permanent fixtures. Artists needed to work quickly and accurately, for should the plaster dry too soon, or the image not translate as planned, the product would need to be scraped down and begun again. This wasted time, product, money and could result in unbalanced imagery. The ability of the fresco to withstand severe environ-
mental conditions, including an earthquake, volcanic eruption and excavated exposure, gives testimony to the staying power of the technique.

Cinnabar brought its own unique challenges and application techniques to the table, and needed to be treated with special care. "To objects painted with minium, the action of the sun and moon is highly injurious. The proper method of avoiding this inconvenience, is to dry the wall, and then to apply, with a hair brush, hot Punic wax, melted with oil; after which, the varnish must be heated, with an application of gall-nuts burnt to a red heat, till it quite perspires. This [process] done, it must be smoothed down with rollers made of wax, and then polished with clean linen cloths, like marble, when made to shine." This application was designed to help seal the paint and protect the surface from damage, but, ironically the result often precipitated chemical changes beyond natural light, as will be examined in Chapter IV.

While the color presented obstacles, the radiant results were well worth the price. The Villa of the Mysteries's glorious vermillion triclinium, painted during the Second Style period, between 60-40 BCE, was, and is, a show-stopper. The intense use of color saturates the room, with the size of the figures and flow of the panels playing out what some scholars believe to be an epic tale of initiation into the cult of Dionysus.

While the true meaning of the Villa's friezes are still being debated, "to be honest, this is all completely baffling, and no amount of modern scholarship has ever managed to unravel the meaning." Imagine the dining couches along the walls, with guests and slaves attendants within the triclinium, and the stale ancient air becomes replaced with a festive, boisterous quality. This "signorum megalographia" illustrates the mythological emphasis of interior design, with the vibrant, figurative portrayals, whom scholars believe to be the Greek god of wine, Dio-
nysus, and his beloved, Ariadne, overseeing the festivities from their front row seat. The intense red allows the regal purple, matrimonial yellow and fleshy figurative colors to literally pop out of the panels and take shape. Replace it with any other color, and the images would lose their hold on those gazing at them from their dining repose.

While little is known of the artists of that era, or who painted the Villa's interior walls, it has been surmised that, "the man who painted the megalographic frieze in the great oecus ...was evidently unassisted in his work." Artists have a style to their work, a visual 'tell', and given the way the triclinium panels were painted, the consistency of the figures and overall composition of the piece, lends itself well to this assertion. The composition also belays the notion and argument that the panels were copies of another piece, for given the challenging architectural nuances of the room, it could have only been laid out as an original to the space.

Artisans are thought to have carried 'pattern books' with examples of stock images for clients to choose from - similar to wallpaper books of today. Mythology played out as a favorite decorative theme, beginning with the Second Style, as illustrated brilliantly in the triclinium of Villa of the Mysteries. Over within Region V of Pompeii, stands the excavated remains of the House of Marcus Lucretius Fronto, a decurion and Priest of Mars, accredited to him through translation of the programmata painted on the exterior domus wall:

"Si pudor in vita quicquam prodesse putatur
Lucretius hic Fronto dignus honore bene est;"  
"If decency [pudor] is thought to help a man get on in life at all
To our Lucretius Fronto that high office which he seeks should fall"

The domus is one which I visited in the summer of 2014. Stepping inside, one discovers a second elegant example of a red-induced Dionysus and Ariadne version, Figure 24, this
time in the *tablinum*, *Figure 25*, exemplifying spectacular Third Style (20 BCE-20 CE) execution. Perhaps, given Lucretius Fronto's *pudor*, this myth of a damsel in distress, abandoned and left to die by her lover, and the god who swooped in to rescue her, was purposely chosen to be front and center in the main room where clients came to conduct business. Perhaps the visual propaganda depicting decency and virtue, purposely reflected back on Marcus Lucretius Fronto as the patron. Red is used well as a visual frame for the scene of action - allowing the figures to play out the scene. Red, yellow and black were the hallmark colors of Third Style, and early Fourth Style (20 CE-79 CE) painting, and the incorporation of all three in this magnificent wall are a true testament to aristocratic status and wealth, and subliminal orchestration, which became popular during the time of the Emperor Augustus. (27 BCE-14 CE).

The *domus* wall paintings emphasize the use of color when portraying mythology, how the images visually impacted everyday life, and the skill of the artist. A second example is the yellow wall of a *cubiculum*, possibly that of a child,[18] displaying a portrait of a young man in a striking example of late Third Style, early Fourth Style mythological works. The design and execution of the *Narcissus and Echo* image, shown in *Figure 26*, not only displays
the elegance of the wall paintings of the era, and imparting of the message regarding vanity to the bedroom’s young occupants, it does so by illustrated a highly sophisticated visual tell, by melding Fourth Style realism of the mytho-logical panel, with Third Style abstract expressionistic symbolism of the wall treatment. For if the painter was familiar with Ovid’s poetic text of the myth, as I strongly argue he was, based on the brilliant composition and execution, it allowed him to illustrate a holistic vision of the poem. He visually transposed the figurative embodiment of Narcissus into his remains as discovered by Echo:

A flower with a yellow center
Surrounded with white petals.¹¹⁹
(Ovid, Metamorphoses, trans. Humphries, p. 73, lines 509-510)

From my artistic perspective, the symbolic nature of the work is significant, displaying the wall painting as a mirror to Ovid’s ending of the myth. As I see it, Narcissus and Echo reflect the stamen, the yellow pigment is the flower’s center, and they are encompassed by the thin, abstract expressionistic Third Style interpretation of white petals. I offer this is critique in defense of my argument that color was not used solely for decorative purposes, but was ingeniously incorporated into the specific compositional design, by artists who were very much aware, and in command, of the visual intent of their works.
As with The Villa of the Mysteries’s cinnabar-based *triclinium*, pigments were used in the yellow *cubiculum* for decoration and for myth-making/story-telling purposes. Both rooms were designed to take on a persona all their own, acting as provocateurs of the myths being played out in full view of the patrons. I firmly believe that the artists of the 1st c. CE, were far more sophisticated than we presently think, for every element was chosen with purpose, with nothing was left to chance, a sign of true craftsmanship and integrity in respect to the works. Reinforcement of this premise lies in the hands of a modern visual interpreter, renowned 20th century abstract expressionist painter, Mark Rothko. For the unnamed artist who created the Lucretius Fronto Narcissus *cubiculum*, did with Ovid then, what Rothko would do 2,000 years later with friezes of Mysteries’s *triclinium* - illustrate myth with form and one primary color - red.

**Figure 28 - A Frieze from The Villa of the Mysteries Triclinium**

**Figure 29 - Mark Rothko Studies for the Seagrams Triclinium Panels**
© 1998 Kate Rothko Prizel & Christopher Rothko / Artists Rights Society (ARS), New York
“The imagery of Rothko’s painting is at once classical and mythological.” Walking into a room displaying works by Mark Rothko, the strong resemblance to, and influence of, ancient Greek and Roman works is striking (see Appendix B). His paintings incorporate archaic architectural forms with transformative myth-making, from such influences as the Greek vases and Roman wall paintings within the respective collections of The Metropolitan Museum of Art.

The sensual friezes of the Villa of the Mysteries command visual attention, as do the counterpart panels displayed within The Rothko Room at the Tate Modern in London. Designed for triclinia of the wealthy, the first for the Villa (60-40 BCE), the second originally for the Seagrams Restaurant at the Four Seasons in New York (1959-1960 CE), both reel with seductive saturating reds throughout their visual spheres. Rothko had already begun studies for the panels, prior to his visit to Pompeii and The Villa of the Mysteries in 1959. As can happen when encountering the ancient murals, he came away feeling a “deep affinity” between the Villa’s walls and the red and maroon panels he was creating. Later, in a conversation with a traveling companion, John Fischer, Editor of Harper’s Magazine, Rothko would remark that “he recognized the same feeling, the same broad expanses of sombre colour,” although his overall intent may have been decidedly different. The importance of the completed works speaks directly to the hold the Villa of the Mysteries, the city of Pompeii and the color red, has held over civilizations beyond its demise in 79 CE. For even Rothko’s choice of using Lithol red (Pr 49), a far less expensive, and rogue, alternative to cinnabar, lends itself to the challenges held by the ancient artists.

This theory, that an abstract expressionist of the modern era, would use ancient wall paintings and artifacts as influences for his work is based on visual corroboration (Appendices
A and B). For I strongly argue that Roman Third Style painting, an outgrowth of the Second Style of which Rothko and the unnamed artist of The Villa of the Mysteries friezes immersed themselves, could be considered the first abstract expressionist movement of the civilized world.128

The Seagrams’ panels, a major commission for Rothko in the late 1950’s, and the finished products were destined for “the walls of the most exclusive room in a very expensive restaurant...a place where the richest bastards in New York will come to feed and show off.”129 Wealth, elitism, an enclosed modern dining forum with rich red visuals, to which guests would come to see and be seen, very Romanesque in intent and execution.

During a subsequent visit to the Rothko’s studio, John Fisher, who came to know him during aboard the USS Constitution’s cruise to Europe on that fate-filled journey, viewed the panels in progress. “This kind of design may look simple,” he [Rothko] remarked, “but it usually takes me many hours to get the proportions and colors just right. Everything has to lock together. I guess I am pretty much a plumber at heart.”130 With the architectural challenges of the unique triclinium structure of the Villa of the Mysteries’s, and laying out the myth around the room, one could sense a parallel line of thinking, with the unnamed ancient artist nodding in agreement and understanding of Rothko’s plight.

Rothko saw in the murals “purple and black and a red like dried blood-breathed and almost palpable feeling of doom.”131 He would venture further giving Peter Selz of the Museum of Modern Art’s thoughts as “celebrating the death of a civilization...their subject might be death and resurrection in classical, not Christian mythology...a modern Dance of Death.”132
Strip away the centuries and examine the basic premise of image making, and the innate artistic nature transcends time. In Rothko’s letter to *The New York Times* in 1943, he stated, “My own art is simply a new aspect of the eternally archaic myth, and I am neither the first nor will be the last compelled to evolve these chimeras of our time,” and went on to make this point, “Since art is timeless, the significant rendition of a symbol, no matter how archaic, has as full validity today as the archaic symbol had then.”

Cinnabar was the seductive shade of Pompeii, which came to symbolize a city. From harnessing the power of mythology, to developing dramatic artistic styles, which transcended and inspired a kindred spirit of the twentieth century to transpose the torch and carry it forward, the choice of red has proven its power.

The color has not come without complications or controversy, both then and now. For an Italian study conducted in 2011, in Herculaneum, has created a direct challenge to that power, uncovering evidence that the chemical changes inherent in red pigment, may be more than meets the eye. The premise raised through the research begs the controversial question - is yellow the new red?
Chapter IV

Chemical Changes and Controversy

Figure 30 - Vermillion #145, Pigment Collection, Harvard University Art Museums

As depicted, two vivid examples of different Pompeian wall painting styles exist within the Villa of the Mysteries and the House of Lucretius Fronto. The luminescence of the Mysteries' red *triclinium*, and the yellow *cubiculum* of the Fronto House, reflect a strong contrast in color selection, as executed in the 1st. c. CE. Their existence and condition highlight the vulnerability extolled on others, for as strong and vibrant as both wall paintings remain, chemical changes and pigment fragility of other works stand apparent, due to environmental exposure, moisture and application of protective surface treatments during the final stages of paint application.

Chemical analysis of excavated Pompeii began in the early 1800's. For centuries, Pompeii has been famous for its scarlet walls, but in the case of vermilion, chemical volatility often caused the shade to darken or go black, as evidenced in pigment bottle no. 145.
displayed in Figure 30. Vitruvius reported that the secretary Faberius, who wished to have his house on the Aventine finished in elegant style, applied vermilion to all the walls of the peristyle; but after thirty days they turned to an ugly and mottled colour. He therefore made a contract to have other colours applied instead of vermilion.”

![Figure 31 - Morphing from Red to Black, House of the Augustales, Herculaneum](image)

The darkening is caused by a realignment of the cinnabar’s atoms, and is known as metacinnabar (a’-HgS), or black mercury sulfide. Two of the primary reasons for this occurrence involved heat and moisture, although the question of why the change targets some images and not others, remains a mystery. Perhaps the shade of vermilion, the binder used, the thickness of the paint layer, or wax process to finish and seal the paint, played a role. Pliny maintained that, “Minium. is assayed by the agency of gold in a state of incandescence: if it has been adulterated, it will turn black, but if genuine, it retains its color.” In the case of Faberius’s garden walls, sunlight was the most likely culprit, as existed in villas spread throughout Pompeii, and in the Herculaneum wall painting in Figure 31.
Yellow pigments had their own chemical challenges, for when exposed to intense heat sources the color morphed into red. On August 24, 79 CE, Mount Vesuvius gave way, with the ensuing eruption suffocating the city of Pompeii under 20' of pumice and ash, and a torrid of hot molten mud of rock, gas and ash, barreling toward on the town of Herculaneum at up to 300 miles-an-hour, blasted into the city, incinerating everything and anyone in its path, and encasing it 60' deep in a cement-hardened substance. Excavated houses and their wall paintings at Herculaneum show the chemical changes cause by the incinerating heat from the pyroclastic blast, such as in Figure 32.

**Figures 32 - Heat-Related Changes, House of Neptune and Amphitrite, Herculaneum**

A subsequent Brandeis University study, performed on a fragment from the University's CLARC, was conducted at the Center for Materials Science and Engineering X-ray Diffraction Shared Experimental Facility at The Massachusetts Institute of Technology (MIT). Using a Bruker Tracer 111-SD Portable Xray Florecense Spectrometer (pXRF), and Fourier Transform Infrared Spectroscopy (FT-IR), the MIT team was able to decipher...
“eight sample sites of varying color.” The results showed presence of calcium (Ca), iron (Fe), cement, plater, lime, aluminum (Al) and silicon (Si), in various degrees. Two of the three red hues used in the painting indicated a cinnabar presence, determined by the varying presence of mercury, sulfur, lead and iron.

The analysis from the scan determined that the iron “could indicate an undercoat of some kind to prevent the blackening of the pigment,” which supports the premise that darkening of red was a known issue, and that efforts may have been made by the artist to protect against possible environmental changes to the color. Pliny makes mention that “genuine minium is adulterated in the manufactories of the company...giving an undercoating of syricum (red lead) to minium is the evident saving of expense.” This strategy allowed cinnabar to be stretched financially, but the impure minium was at a higher risk of chemical change. “Genuine minium ought to have the brilliant color of the kermes berry; but when that of inferior quality is used for walls, the brightness of it is sure to be tarnished by the moisture.”

Their findings also uncovered the presence of yellow ochre, which may have been used as an undercoat for the red as well in a segment of the fragment. “Yellow ochre may have transformed into hematite [red ochre] during the [Mt. Vesuvius] eruption to create the darker red color and further blackened due to the formation of magnetite, caused by a reaction with calcite.”

The 2011 study by the National Optics Institute (NOI), based in Florence, parallels with the MIT findings, and evokes a revolutionary take on current scholarly standings. The NOI team performed a series of tests on red ochre-based wall paintings at the Villa of the Papyri in Herculaneum, checking “several areas with the XRF with a total of 50 measuring
points on 19 walls to exclude that there was mercury or lead. The team stunning conclusion, explores evidence that many of the red-shaded walls were, in all actuality, yellow. "At the moment, there are 246 walls perceived as red, and 57 as yellow. But, based on the new research, the numbers must have been, respectively, 165 and 138. The discovery allows us to rethink the original appearance of the city in radically different way from how we are used to – in which red, indeed 'Pompeian red',\textsuperscript{152} has been prevalent."\textsuperscript{153}

**Figure 33 - Villa of the Papyri, Herculaneum: Red or Yellow?**

From an interior design perspective, I argue the possibility that yellow was used purposefully as a primer, for reds are inherently expensive to paint with, even by today's standards, due to their translucent nature. The full color of red comes through applications in a series layers and, given the prohibitive cost in ancient times and the challenge of working on wet plaster, the use of a colored primer to prepare the surface would have been one expedient and cost-saving solution. Using an undercoating of yellow, with a red wash on top gave the illusion of red on the cheap, and the visual warmth of abundantly accessible yellow
ochre made perfect sense, especially as both hues - along with black - made up the triumvirate of Third Style and Fourth Style painting, and was an integrated part of the palette.

In his writings on cinnabar, Vitruvius notes that yellow ochre was also found by slaves in the silver mines and, "whenever a vein of ochre was found there, they would follow it up like silver, and so the ancients had a fine supply of it to use in the polished finishings of their stucco work."

While the new theory of 'yellow is the new red' garners healthy skepticism, and with Pompeii yet to be analyzed under the same level of scrutiny, complicated by the fact that the study purposely did not analyze cinnabar-based pieces, the claims presented cannot be dismissed out-of-hand without further exploration of the data. The root of the argument pits established historical and scholarly information, against a new evidence carrying climatic consequences and the controversy, with one historian weighing in, "I am always a bit suspicious of these claims. We know that some of the red was once yellow, but I'm not sure that we can be certain about the proportions. What is certainly true, though, is that the heat had some effect on the colours; it's another case in which we can see that Pompeii was not the time capsule we sometimes imagine it to be."

Discoloration and fading was not just an issue for the wall paintings of the two ancient cities. When Mark Rothko created the Seagrams murals of 1958-9, his choice of red was Lithol (Pigment Red 49), more frequently used at the time in printing ink. Possible reasons could have been the cost, which was much more in line financially than a vermillion-based color, another perhaps was for experimental purposes.

The same paint would be used to produce the Harvard murals (1962), destined for a prominent campus triclinium, and while the depth of the color was succulent, Rothko's
work faced the same fate as his muses from the ancient city. The fading that occurred to the Harvard panels would cause them to be taken down in 1979. After extensive restoration, they have re-emerged in striking fashion and, after a six-year, multimillion dollar renovation, the Harvard Art Museums reopened in the late fall of 2014, with the Rothko panels prominently displayed. The exhibit introduces the newest form of anti-fading technique, digital projection technology, by which the color of the University’s panels are enriched by color enhancement projected directly onto the canvases.158 This controversial form of artistic expression is a clear demonstration of blending the old with the new, but perhaps the fading away is part of the natural process, whether standing in front of an ancient Pompeiiian wall painting, or modern day Rothko.

“At 4 p.m. every day, a small crowd gathers in the gallery to watch museum staff turn off the projectors, allowing the paintings to be seen in their darker, faded state. It’s an odd ritual, this daily gathering to watch the lights go down on the Rothko’s. Surely there’s a curiosity about the technology in use, but also, I would guess, a hunger for a glimpse of the thing itself free of mediation, a pull toward the aura of the real.”158

I have an odd sense that Vitruvius and Pliny would agree.
Conclusions

"Like the Pompeian street, many a Pompeian house would have been, in our terms, an assault on the visual senses," (Beard). In July of 2014, I journeyed to the cities of Pompeii and Herculaneum for the first time, with a small group of archaeologists, students and Latin teachers, and my experience mirrored the opening statement. Over the course of the two days spent on the sites, the many stunning visual treasures in and around the excavated domus, were not just an assault, but true visual overload.

One intention of the trip was deciding on the research topic for this paper, which was selected using the following criteria - what singular impression of Pompeii describes its essence - and the answer was cinnabar. The red infusion of minium throughout the city was indeed symbolic and certainly seductive, but the sublethal component was unexpected and compelling. The mineral encompasses Pompeiian culture and society - wealth, beauty, greed, economics, spirituality, artistic expression and the role myth played in daily life.

I am trained as a printmaker and painter, adding ancient Greek and Roman studies to the mix. In determining conclusions for this thesis, I have scaled the criteria down to two: one objective, the other subjective. The first, that cinnabar, minium, vermillion, was the richest, most expensive and powerful color of Pompeii, and truly exemplifies the essence of the city. The second, that the artists of the 1st c BCE-1st c CE were far more sophisticated in their understanding and approach to image creation than we think, or give credit.

The controversy surrounding Herculaneum and Pompeii not being as red as first thought, will resolve itself with the advancement of technology and further study. These efforts will hopefully lead to new discoveries, and preservations of these historic sites.
1936
Interior.
Oil on hardboard,
23 15/16 x 18 5/16 in.
National Gallery of Art,
Gift of The Mark Rothko
Foundation, Inc.

1945-46
Tentacles of Memory.
Watercolor and ink on
paper, 21 3/4 x 30 in.
San Francisco Museum of
Modern Art, Albert M.
Bender Collection, Albert
M. Bender Bequest Fund.

1951
Number 18.
Oil on canvas, 81 3/4 x 67 in.
Manson-Williams-Proctor
Institute, Utica, New York

1959
Red on Maroon, 1959.
Mark Rothko (1903-1970)
The Tate Modern
Photo: © Tate, London 2015.

Early 1940's
Untitled.
Oil on canvas, 35 11/16 x 24
in. National Gallery of Art,
Gift of The Mark Rothko
Foundation, Inc.
Endnotes

1 The author holds a B.F.A. from Ohio Northern University, and an M.Ed. from St. Lawrence University.


3 Weber understood the need for organization of excavation sites, and was instrumental in creating the first detailed blueprints of ancient structures and systemizing of the cataloging of retrieved artifacts. Lazer, Resurrecting Pompeii, 6.


5 Silvana Carannante et al., “Pompeian Yellow,” (study presented at Sapienza University in Rome, Italy, September 2011), 2. Unpublished, paper provided directly by Sergio Omarini, October 9, 2014.

6 “…hot, dry, chaotic avalanches of pumice, ash, and gases…they can travel at astonishingly high speeds…with wood heated up to 742 degrees Fahrenheit…” Joseph Jay Deiss, Herculaneum: Italy’s Buried Treasure, (New York: Harper & Row, 1985), 16, 18.

7 Silvana Carannante et al., “Pompeian Yellow,” (study presented at Sapienza University in Rome, Italy, September 2011), 2.

8 Ibid. 2, 3.


12 In pigments, black and white are absent of color and quantized as neutrals. They are used to darken or lighten color, respectively known as shades and tints.

13 Ironically, while the natural state of Pompeii continues to decline, the act of stripping works from the site during early excavations for personal collections of the Bourbon Kings, resulted in the survival of many pieces, now on display at the National Museum of Archaeology in Naples.


15 “The Greeks call this red earth ‘milios,’ and give to minium the name of ‘cinnabaris,’ and hence, the error caused by the two meanings of the same word.” Pliny, The Natural History, Book XXXIII, Chap. 38, 120. Editor’s note: The Greek’s version was red ochre, peroxide of iron.

16 Pliny, The Natural History, Book XXXIII, Chap. 37, 120.


18 Ibid.
19 “There is a mineral also found in the veins of silver, which yields a bhumour that is always liquid, and is known as 'quicksilver'. It acts as a poison upon everything, and pierces vessels even, making its way through them by the agency of its malignant properties.” Pliny, The Natural History, Book XXXIII, Chap. 32, 113.


22 “In the ancient art of alchemy, mercury, sulfur, and salt were the Earth's three principle substances.” Sloane, “Mercury: Elements of the Ancients,” 2.


25 “…that of most note coming from Sisapo, a territory of Bactica, the mine of minium there forming a part of the revenues of the Roman people.” Pliny, The Natural History, Book XXXIII, Chap. 40, 122.

26 Healy, Mining and Metallurgy in the Greek and Roman World, 42.

27 Ibid, 66, 268 n404.

28 “When the cinnabar has given up its quicksilver, and thus lost the natural virtues that it previously had, it becomes soft in quality and its powers are feeble.” Vitruvius, The Ten Books on Architecture, trans. Morris Hicky Morgan, Ph.D., LL.D., (Cambridge: Harvard University Press; London: Oxford University Press, 1914), 7.5., Book VII, Chapter IX, 216.


30 Ibid.

31 Circular were stone, rectangular were wood. Healy, Mining and Metallurgy in the Greek and Roman World, 91.

32 Ibid.

33 Cohen Duncan, “Roman Deep-vein Mining,” 2.

34 “…opening shafts up in many places and digging deep into the earth, [they] search for the strata rich in silver and gold. ...” Greek historian, Diodorus Siculus (90-30 BCE), “[5.36-38; SB, p. 186]. Cohen Duncan, “Roman Deep-vein Mining.”

35 Crushed skeletons were discovered in Asia Minor. Cohen Duncan, “Roman Deep-vein Mining,” 5.


37 Healy, Mining and Metallurgy in the Greek and Roman World, 100-101.


39 Ibid.


41 Healy, Mining and Metallurgy in the Greek and Roman World, 82.


43 “The Romans employed large numbers of slaves to hale out galleries...using buckets made of esparto grass rendered water tight by being soaked in tar.” Healy, Mining and Metallurgy in the Greek and Roman World, 94, 95.

44 Archimedian Screw and the Waterwheel. Healy, Mining and Metallurgy in the Greek and Roman World, 94.

Ibid.

Healy, *Mining and Metallurgy in the Greek and Roman World*, 94.

Ibid. 95-96.

Ibid. 98-100.

Ibid. 100.

[Strabo], Healy, *Mining and Metallurgy in the Greek and Roman World*, 136.


"Romans mined cinnabar, mercury sulfide, at Almaden in Spain. They sent criminals to work the mercury mines, and this was regarded as a death sentence." Simon Cotton, "Chemistry in its Element: Dimethylmercury," The Royal Society of Chemistry, 1. Last modified 2015. [http://www.rsc.org/chemistryworld/podcast/CIIEcompounds/transcripts/Dimethylmercury.asp](http://www.rsc.org/chemistryworld/podcast/CIIEcompounds/transcripts/Dimethylmercury.asp).

"The Romans used cinnabar as an orange-red pigment, but also roasted the cinnabar to get mercury metal. Whether you inhale cinnabar dust or mercury vapour, the result is the same: mercury poisoning." Cotton, "Chemistry in its Element: Dimethylmercury," 1.


Ibid. 140.


Healy, *Mining and Metallurgy in the Greek and Roman World*, 139.


[Aristotle and Theophrastus], Healy, *Mining and Metallurgy in the Greek and Roman World*, 190, 191.

Healy, *Mining and Metallurgy in the Greek and Roman World*, 141.

[Plato "Politicus 303 D."], Healy *Mining and Metallurgy in the Greek and Roman World* 141.

Healy, *Mining and Metallurgy in the Greek and Roman World*, 151.

Ibid, 150.

Ibid. 142.

"...for it is not allowable to reduce and refine the ore upon the spot, it being brought to Rome [from Spain] in a crude state and under seal, to the amount of about two thousand pounds per annum." Pliny, *The Natural History*, XXXIII, Chap. 40, 122.


Inflation calculator estimating from 1833 to 2014. [www.davemanuel.com](http://www.davemanuel.com).


Pliny, *The Natural History*, XXXIII, Chap. 39, 121.


“Cinnabar was a bisulphuret of mercury. This ore is the great source of the mercury of commerce, from which it is obtained by sublimation. When pure, it is the same as the manufactured vermillion of commerce.” Pliny, The Natural History, Book XXXIII, Chap. 36, 119 n50.

“There is a mineral also found in the veins of silver, which yields a bumbour that is always liquid, and is known as ‘quicksilver.’ It acts as a poison upon everything, and pierces vessels even, making its way through them by the agency of its malignant properties.” Pliny, The Natural History, Book XXXIII, Chap. 32, 113.

“It is also in silver-mines that “minium” [cinnabar] is found, a pigment held at the present day in very high estimation.” Pliny, The Natural History, Book XXXIII, Chap. 36, 119.

Pliny, The Natural History, Book XXXIII, Chap. 40, 123.

D’Itri and D’Itri, “Mercury Contamination: A Human Tragedy,” 120.

“...the letters made with it being more distinct, even on gold or marble, it is used for the inscriptions upon tombs,” Pliny, The Natural History, XXXIII, Chap. 40, 123.

“...we find it satisfactorily established that it was the custom upon festivals to colour the face of the statue of Jupiter even with minium, as well as the bodies of triumphant generals; and that it was in this guise that Camillus celebrated his triumph.” Pliny, The Natural History, XXXIII, Chap. 36, 119.

U.S. Environmental Protection Agency, last modified December 29, 2014. [www.epa.gov/mercury/effects.htm]


“As it is a fact generally admitted, that minium is a poison, I look upon all recipes given as highly dangerous which recommend its employment for medicinal purposes...I should never recommend it to be used for medicine.” Pliny, The Natural History, Book XXXIII, Chap. 41, 124.

Ibid.


Pliny, The Natural History, XXXIII, Chap. 40, 120, n56.

“...its use is described in the Canon of Medicine by the Persian physician Ibn Sina (Avicenna).” Brooks, “Industrial Use of Mercury in the Ancient World,” 19.


“There were few windows, and those that there were, small and on the upper story, well above eye-level...the interiors of houses were made to be seen. Of course, they were closed up and forbidding by night, and even by day the view towards the heart of the house might sometimes have been blocked [for security reasons] by screens, internal doors and curtains.” Beard, The Fires of Vesuvius: Pompeii Lost and Found, 83, 101.
"The temptation to find the remains of Poppaea's local residence has proved just too strong... the prime candidate is the 'vast villa at Oplontis... for it is a very large property, on an imperial scale... but, the evidence is extremely flimsy.' Beard, *The Fires of Vesuvius: Pompeii Lost and Found*, 46.


Developed during the last 17 years of Pompeii, one of two types of political advertisements painted on houses and businesses, in which the supporter, who could be a woman, is named. Liisa Savunen, "Women and Elections in Pompeii," 194, 195. [http://markbwilson.com/pdf/articles/Savunen_Pompeii.pdf](http://markbwilson.com/pdf/articles/Savunen_Pompeii.pdf)

"Subdividing the tasks according to individual expertise, with, for example, one man preparing the background of white 'wash and another the actual lettering.' Cooley and Cooley, *Pompeii: A Sourcebook*, (New York: Routledge, 2004), 125.

Ibid.

"...is through the same religious motives that it is employed at the present day for colouring the ungents used at triumphal banquets, and that it is the first duty of the censors to make a contract for painting the statue of Jupiter with this colour." Pliny, *The Natural History*, Book XXXIII, Chap. 36, 119.

"It is our red ochre, peroxide of iron, mixed in a greater or less degree with argillaceous earth." Pliny, *The Natural History*, Book XXXIII, Chap. 38, 120, 155.

Pliny, *The Natural History*, Book XXXIII, Chap. 38, 120.

Early 4th c. imperial regulations made distinctions between wages made by 'figure painter' and 'wall painter'. Beard, "The Fires of Vesuvius: Pompeii Lost and Found," 124.


Pliny, *The Natural History*, Book XXXIII, Chap. 40, 122, 123.

Pliny, *The Natural History*, Book XXXIII, Chap. 40, 123.

"The Latin word for dining room, triclinium means literally 'three couches', reflecting the common pattern of formal dinners in the Roman world, which involved the participants reclining, three to a couch on three separate couches." Mary Beard, *The Fires of Vesuvius: Pompeii Lost and Found*, 94.


"A traditionally impressive style consisting of figured subjects which were based on well-known sculptural types." [Vitruvius, De architectura 7.5.2.] John R. Clarke, *The Houses of Roman Italy 100 B.C.-A.D. 250: Ritual, Space, and Decoration*, 98, 134.


This theory is based on the unique shape and challenges of the room, including a window and two doorways, and the way the painter formed the figures to the space. John R. Clarke, *The Houses of Roman Italy 100 B.C.-A.D. 250: Ritual, Space, and Decoration*, 99.

Within the House of Marcus Lucretius Fronto, "A room to the left of the garden contains a painting that shows a 'writing-case and a letter addressed to Marcus Lucretius, priest of Mars and decurion of the city.' Ancient Pompeii - Villa of the Mysteries and Other Houses. [mr_sedivy.tripod.com/pompeii_o.html](http://mr_sedivy.tripod.com/pompeii_o.html)


119 “The narcissus flower is considered one of the many flowers of love. It can also represent appreciation for an other person’s beauty when given as a gift. Conversely, these flowers can be a sign of vanity, and can be sent as a warning to keep that ‘vanity in check.’” [http://flowerinfo.org/narcissus-flowers](http://flowerinfo.org/narcissus-flowers).


123 A falling-out would lead to the murals being donated to The Tate Modern in 1970, on the day he would commit suicide. “In 1959...Rothko suddenly and unexpectedly repudiated his agreement to provide 600 square feet of paintings for the most exclusive room in the new Four Seasons restaurant at the Seagram Building in New York - the most prestigious public commission that had ever been awarded to an abstract expressionist painter, a tremendously lucrative and enviable chance to take his work to new heights of ambition.” Jonathan Jones, “Feeding Fury,” *The Guardian*, December 6, 2002, 1. [http://www.theguardian.com/culture/2002/dec/07/artsfeatures](http://www.theguardian.com/culture/2002/dec/07/artsfeatures).


125 Ibid.

126 “I hope to ruin the appetite of every son of a bitch who ever eats in that room,” he gloated, with paintings that will make those rich bastards “feel that they are trapped in a room where all the doors and windows are bricked up.” Jones, “Feeding Fury,” 5.


129 Fischer, “The Easy Chair: Mark Rothko - Portrait of the Artist as an Angry Man,” 16.

130 Ibid. 21.

131 Ibid. 22.

132 Ibid.


“...it must be smoothed down with rollers made of wax, and then polished with clean linen cloths, like marble, when made to shine.” Pliny, The Natural History, Book XXXIII, Chap. 40, 123.

Ibid.


“Yellow ochre (a clay base coloured with limonite) ... could be transformed into red ochre by roasting it in a process similar to producing Usta (our Minium), which the Romans and the Greeks before them obtained by heating up white lead (cerus).” Sergio Omarini, “Notes on Colours and Pigments in the Ancient World,” National Institute of Optics - C.N.R. Florence, Italy, Journal of the International Colour Association. (2012): 64.

Classical Artifact Research Collection.


Ibid. 18.

Pliny, The Natural History, XXXIII, Chap. 40. 122.

Ibid, 123.

Crandall, 18.

Silvana Carannante et al., “Pompeian Yellow,” (study presented at Sapienza University in Rome, Italy, September 2011).

Minium-based walls were excluded from the study. Silvana Carannante et al., “Pompeian Yellow,” 3.

Silvana Carannante et al., “Pompeian Yellow,” 3.

Generalized term denoting a specific shade of red famous in Pompeii.


“Pigment alterations of yellow ochre and colour changes caused by heat resulting from the Vesuvius eruption in 79 AD. were particularly interesting when studied by non-invasive VIS-spectra and CIE L*a*b* measurements. Colour alterations from yellow ochre to red orange were possible to see in several rooms in the house of Marcus Lucretius (Fronto).” U. Knuutinen, H. Mannerheim and S. Hornytzky, “Project Report of Pigment Analyses of the Fourth Style Wall Paintings in the Casa di Marco Lucrezio (IX 3, 5.24) in Pompeii. EVTEK University, Finland, academi.edu.


“Litbol red is an aso pigment 8 that comprises a family of sodium (PR 49), barium (PR 49:1), calcium (PR 49:2), and strontium (PR 49:3) salts of diazotised Tolbs (2-naphtblyamine-1-sulfonic) acid coupled with 2-naphtbol. The metal dictates the shade of the pigment, which ranges from yellow to purplish blue...” Standeven, “The History and Manufacture of Lithol Red, a Pigment Used by Mark Rothko in his Seagram and Harvard Murals of the 1950s and 1960s,” 3.

Standeven, “The History and Manufacture of Lithol Red, a Pigment Used by Mark Rothko his Seagram and Harvard Murals of the 1950s and 1960s,” 2, 3.


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